User Manual

ENGLISH

Model : VC-2MC-M/C340
VC-4MC-M/C180

vieworks

Revision History

Revision	Date	Descriptions
1.0	2010/10/01	Initial release
1.1	2010/12/13	Adding missing commands (”scl”,”gcl”).
1.2	2010/12/21	Adding VC-2MC-M/C340 model data
1.3	2011/04/07	Revising Maximum Frame rate (Table 1.1)
1.4	2011/07/12	Adding 10 bit supports on 2 Tap and 4 Tap

Contents

1. Precautions

General

- Do not drop or damage the device.
- Do not disassemble, repair or alter the device.
- Do not let children touch the device without supervision.
- Do not use the device for any other purpose than specified.
- Contact your nearest distributor in case of trouble or problem.

Installation & Maintenance

- Do not install the device in a place subject to direct sun light, humidity, dust or soot.
- Do not place magnets near the product.
- Do not place the device next to heating equipments.
- Be careful not to let liquid like water, drinks or chemicals leak inside the device.
- Clean the device often to remove dust on it.
- In clearing, do not splash water on the device but wipe it out with smooth cloth or towel.

Power Supply

It is recommended the use of 12V DC with ±10% of voltage, over 1A of output current with KC, CE or other local certification. (※ Vieworks Co., Ltd. does NOT provide power supplies with the devices.)

If voltage over 16V is supplied, it will cause damages to the device.

2. Warranty

For information about the warranty, please contact your factory representative.

3. Compliance & Certifications

3.1. FCC Declaration

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at own expenses.

3.2. CE : DoC

EMC Directive 2004/108/EC.

Testing Standard EN 55022:2006+A1:2007, EN 55024:1998+A1:2001+A2:2003

Class A

4. Package Contents

4.1.1. VC Series

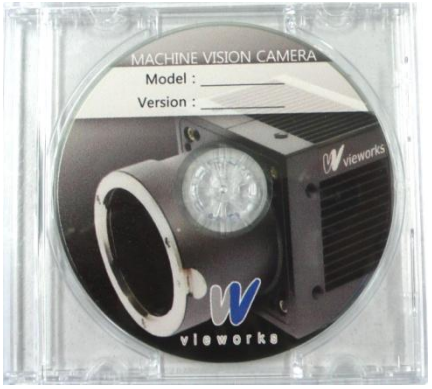
Camera (1 unit)

< C-Mount Type>

< F-Mount Type >

4.1.2. Mount Plate (OPTION)

4.1.3. CD

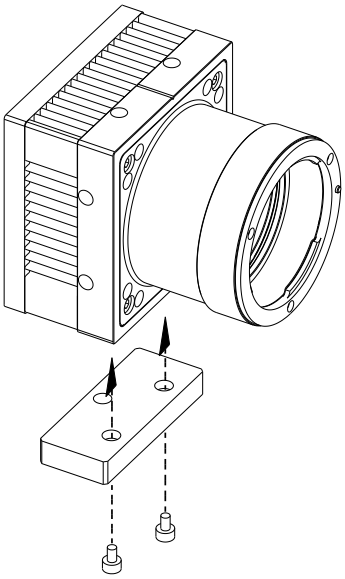


5. Installation

5.1.1. VC Camera (Camera Link Interface)

- Camera Link Cable Connection
- Power Cable Connection
- Control Cable Connection

5.1.2. Mount Plate



- The Mount Plate is provided as an optional item.
- The camera can be fixed without using this Mount Plate.

6. Overview

VIEWORKS VC series is an industrial Area Scan Camera with high-speed frame rate using high resolution CMOS sensors.

With its high reliability and durability, this camera is suitable for machine vision requiring high-speed continuous shooting. Following are the system block diagram and the main features.

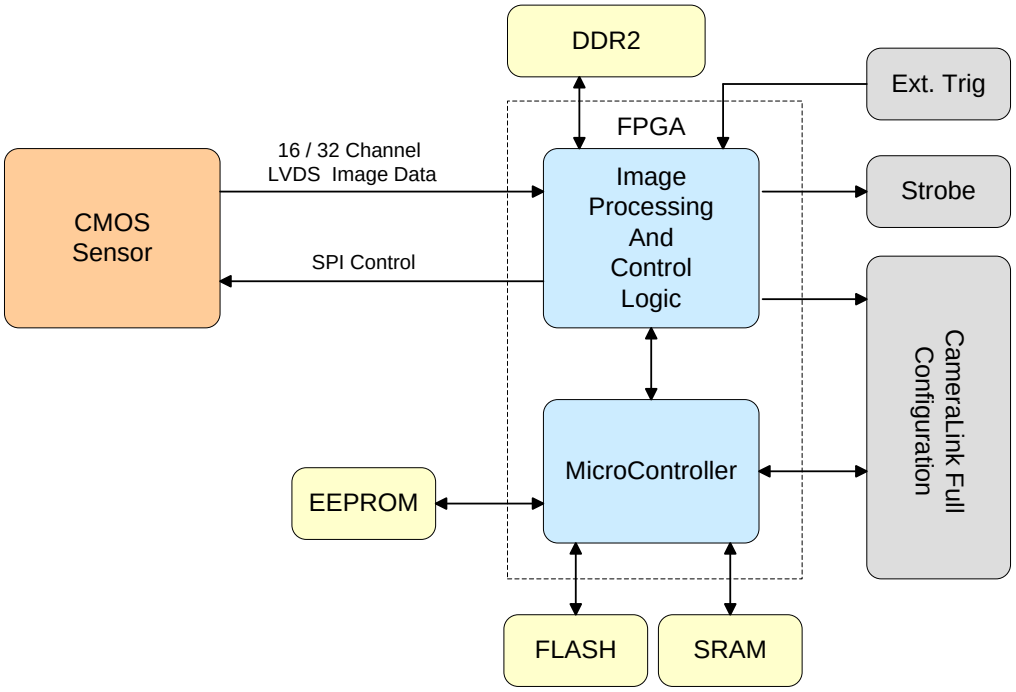


Figure 6.1 System Block Diagram

- **Main Features**
  - High Speed 4 Mega-pixel CMOS image sensor
  - Electronic exposure time control(Global shutter)
  - Strobe Output
  - Defective Pixel Correction
  - Output Channel 2 Tap, 4Tap, 8 Tap, 10 Tap
  - Gain / Offset Control
  - Test Image
  - LVDS(RS-644) Serial Communication by Camera Link Interface
  - Temperature Monitor
  - Field Upgrade

6.1. Specifications

Model	VC-2MC-M/C340		VC-4MC-M/C180	
Image Sensor	CMV 2000		CMV 4000	
Active Size	2048 X1088 (2 Megapixels)		2048 X 2048 (4 Megapixels)	
Pixel Size	5.5 ㎛ × 5.5 ㎛		5.5 ㎛ × 5.5 ㎛	
Quantum Efficiency	50 % at 550 nm with micro lens		50 % at 550 nm with micro lens	
Imaging Area (H×V)	11.26 × 5.98 ㎜ (Diagonal: 12.75 ㎜)		11.26 × 11.26 ㎜ (Diagonal: 15.92 ㎜)	
Sensor Type	CMOS (Mono / Color)		CMOS (Mono / Color)	
Max. Frame Rate (at full Image)	8 bit	10 bit	8 bit	10 bit
	2 Tap (Base) : 74.4 fps		2 Tap (Base) : 39.6 fps	
	4 Tap (Medium) : 148.5 fps		4 Tap (Medium) : 78.9 fps	
	8 Tap (Full): 295.4 fps	N/A	8 Tap (Full): 157.1 fps	N/A
	10 Tap (Full): 337.6 fps	N/A	10 Tap (Full): 179.5 fps	N/A
Transfer Time (at full Image)	2 Tap (Base) : 13.44 ㎳		2 Tap (Base) : 25.3 ㎳	
	4 Tap (Medium) : 6.73 ㎳		4 Tap (Medium) : 12.67 ㎳	
	8 Tap (Full): 3.38 ㎳	N/A	8 Tap (Full): 6.37 ㎳	N/A
	10 Tap (Full): 2.96 ㎳	N/A	10 Tap (Full): 5.58 ㎳	N/A
Dynamic Range	60 ㏈			
Exposure Control	Electronic Global shutter			
Pixel Clock	85 ㎒			
Data Output	8 bit (2, 4, 8 or 10 Tap) or 10 bit (2 or 4 Tap)			
Trigger Input	Camera-Link : CC1 External Port: 3.3 – 5.0V Logic level input, optically isolated.			
Gain Control	Range: 0~ 12 dB, 64-step Gain Control			
Offset Control	Range: 0 ~ 63 LSB, 64-step Offset Control			
Mechanical Spec. (W×H×L), weight	68 mm x 68 mm x 54 mm, 420 g (With F-mount)			
Lens Mount	C Mount or F Mount			
Power Requirements	12 VDC ± 20% MAX 6.0 W @ 12 V DC			
Environment	Operating: 0 °C ~ 40°C, Storage: -30 °C ~ 65°C			
Connectors	**Data Transfer/ Communication:** Two, 26 pin, Female MDR connector **Power:** 6 pin, Hirose HR connector **Control:** 4 pin, Hirose HR connector			

Table 6.1 Specifications of echo model

6.2. Spectral Response

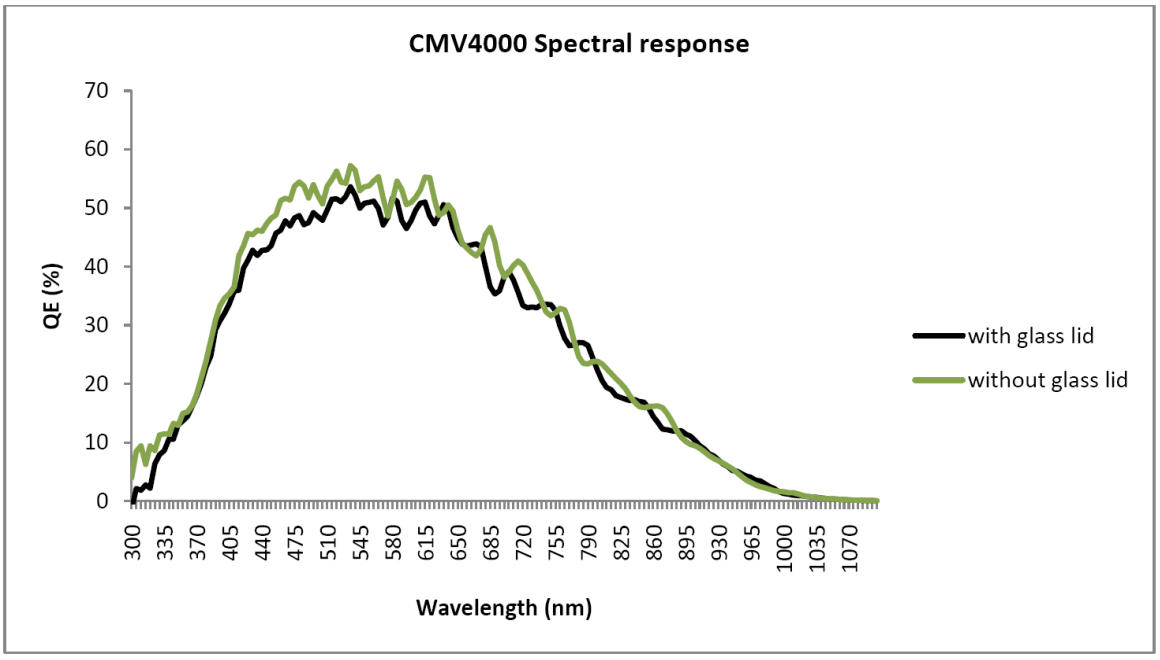


Figure 6.2 Spectral Response for Mono

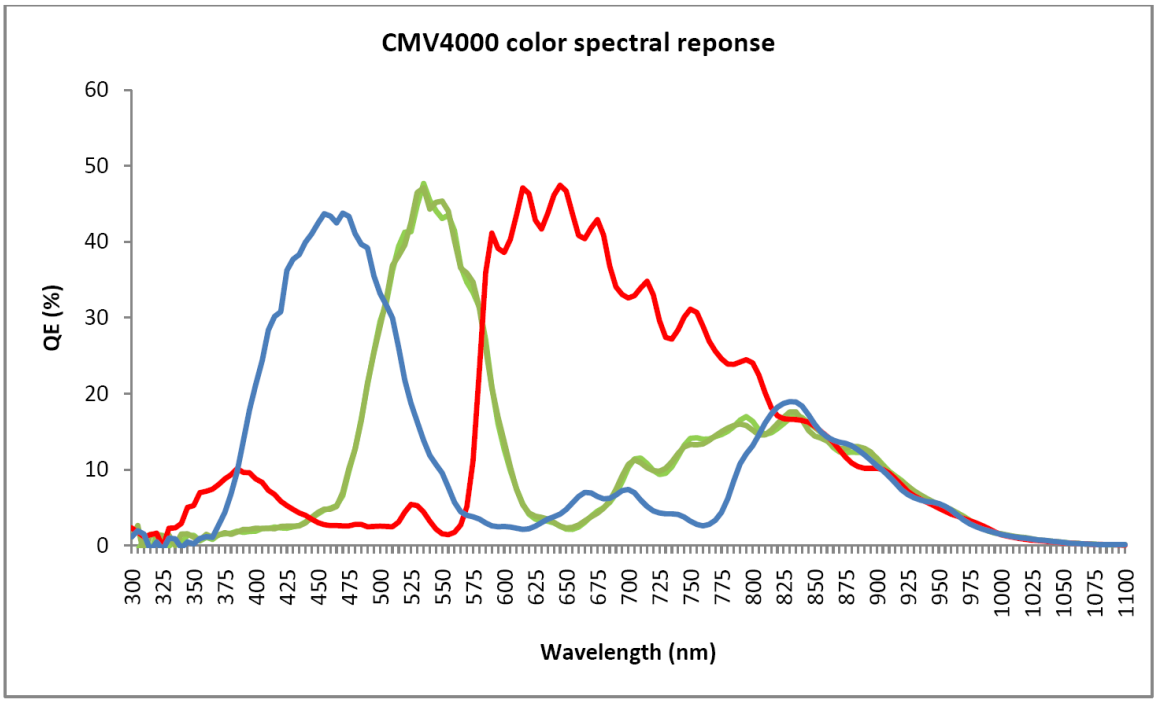


Figure 6.3 Spectral Response for Color

6.3. Camera Interface

As shown in the following figure, 3 types of connectors and status indicator LED are located on the back of the camera and have the functions as follows:

- 6 pin Power Input Connector : camera power input,
- 4 pin Control Connector : external trigger signal input and Strobe output
- 26 pin Camera-Link Connector #1 : video data transmission, camera control
- 26 pin Camera-Link Connector #2: video data transmission
- Status LED : power and operation mode display

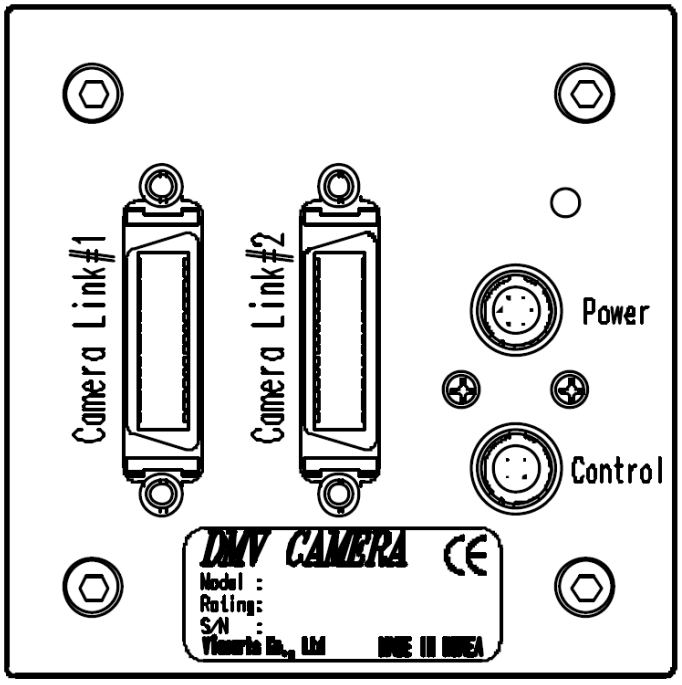


Figure 6.4 VC Series Connectors and LED

6.3.1. Camera Link Connector

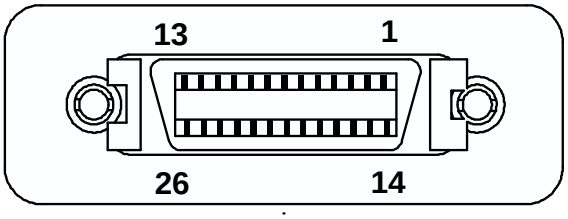


Figure 6.5 Camera Link Connector

Following list shows the pin configuration of connector.

PAIR List	Pin	Signal Name	Type	Description
PAIR 0	**1**	Ground	Ground	Cable Shield
	14	Ground	Ground	Cable Shield
PAIR 1	**2**	-X0	LVDS - Out	Camera Link Transmitter
	15	+X0	LVDS - Out	Camera Link Transmitter
PAIR 2	**3**	-X1	LVDS - Out	Camera Link Transmitter
	16	+X1	LVDS - Out	Camera Link Transmitter
PAIR 3	**4**	-X2	LVDS - Out	Camera Link Transmitter
	17	+X2	LVDS - Out	Camera Link Transmitter
PAIR 4	**5**	-XCLK	LVDS - Out	Camera Link Transmitter
	18	-XCLK	LVDS - Out	Camera Link Transmitter
PAIR 5	**6**	-X3	LVDS - Out	Camera Link Transmitter
	19	+X3	LVDS - Out	Camera Link Transmitter
PAIR 6	**7**	+ SerTC	LVDS - In	Serial Data Receiver
	20	- SerTC	LVDS - In	Serial Data Receiver
PAIR 7	**8**	- SerTFG	LVDS - Out	Serial Data Transmitter
	21	+ SerTFG	LVDS - Out	Serial Data Transmitter
PAIR 8	**9**	- CC 1	LVDS - In	Software External Trigger
	22	+ CC 1	LVDS - In	Software External Trigger
PAIR 9	**10**	N/C	N/C	N/C
	23	N/C	N/C	N/C
PAIR 10	**11**	N/C	N/C	N/C
	24	N/C	N/C	N/C
PAIR 11	**12**	N/C	N/C	N/C
	25	N/C	N/C	N/C
PAIR 12	**13**	Ground	Ground	Cable Shield
	26	Ground	Ground	Cable Shield

Table 6.2 Pin Assignments for Camera Link Connector 1

PAIR List	Pin	Signal Name	Type	Description
PAIR 0	1	Ground	Ground	Cable Shield
	14	Ground	Ground	Cable Shield
PAIR 1	2	-Y0	LVDS - Out	Camera Link Transmitter
	15	+Y0	LVDS - Out	Camera Link Transmitter
PAIR 2	3	-Y1	LVDS - Out	Camera Link Transmitter
	16	+Y1	LVDS - Out	Camera Link Transmitter
PAIR 3	4	-Y2	LVDS - Out	Camera Link Transmitter
	17	+Y2	LVDS - Out	Camera Link Transmitter
PAIR 4	5	-YCLK	LVDS - Out	Camera Link Transmitter
	18	+YCLK	LVDS - Out	Camera Link Clock Tx
PAIR 5	6	-Y3	LVDS - Out	Camera Link Channel Tx
	19	+Y3	LVDS - Out	Camera Link Channel Tx
PAIR 6	7		Not Used	Connected with 100 ohm
	20		Not Used	
PAIR 7	8	-Z0	LVDS - Out	Camera Link Transmitter
	21	+Z0	LVDS - Out	Camera Link Transmitter
PAIR 8	9	-Z1	LVDS - Out	Camera Link Transmitter
	22	+Z1	LVDS - Out	Camera Link Transmitter
PAIR 9	10	-Z2	LVDS - Out	Camera Link Transmitter
	23	+Z2	LVDS - Out	Camera Link Transmitter
PAIR 10	11	-ZCLK	LVDS - Out	Camera Link Transmitter
	24	+ZCLK	LVDS - Out	Camera Link Clock Tx
PAIR 11	12	-Z3	LVDS - Out	Camera Link Channel Tx
	25	+Z3	LVDS - Out	Camera Link Channel Tx
PAIR 12	13	Ground	Ground	Cable Shield
	26	Ground	Ground	Cable Shield

Table 6.3 Pin Assignments for Camera Link Connector 2

Model	Camera-Link Output Mode	Camera-Link Configuration	Camera-Link Connector 1	Camera-Link Connector 2
VC – 4MC-M/C180	2 Tap's	BASE	O	X
	4 Tap's	MEDIUM	O	O
	8 Tap's	FULL	O	O
	10 Tap's	FULL	O	O

Table 6.4 Connector Connection per Camera Link Output Mode

In connecting the connector to Frame Grabber, it is required to be careful of sequence of Camera Link Connector. If the sequence is changed, camera image output and serial communication do not work properly.

6.3.2. Power Input Connector

Power input connector of camera is Hirose 6 pin connector(part # HR10A-7R-6PB). Pin arrangement and configuration are as follows:

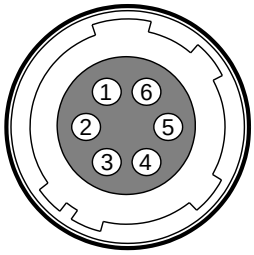


Figure 6.6 Pin Arrangement of Power Input Connector

Pin Number	Signal	Direction	Function
1, 2,3	+ 12V DC	Input	DC Power Input
4,5,6	DC Ground	Input	DC Ground

Table 6.5 Pin Configuration of Power Input Connector

Power plug can be configured using the Hirose 6 pin plug (part # HR10A-7P-6S) or compatible parts enclosed in the camera box. For power supply, it is recommended to use the power adapter twith over 1A current output at 12VDC ±10% voltage output.

Cautions for Power Input

Make sure the power is turned off before connecting the power cord to the camera. Otherwise, damage to the camera may result.

If the camera input voltage is greater than 16 V, damage to the camera may result.

6.3.3. Control Connecter

Control connector is Hirose 4 pin connector(part # HR10A-7R-4S) and consists of external trigger signal input and strobe output port. Pin arrangement and configuration are as follows:

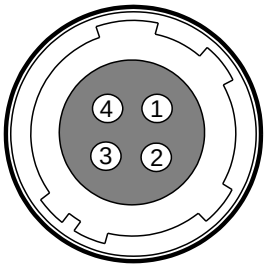


Figure 6.7 Pin Arrangement of Control Connector

Pin Number	Signal	Direction	Function
1	**Trigger Input +**	Input	
2	**Trigger Input -**	Input	
3	**DC Ground**	-	DC Ground
4	**Strobe Out**	Output	3.3V TTL Output Output resistance : 47 Ω

Table 6.6 Pin Arrangement of Control Connector

Mating plug connector can use Hirose 4 pin plug(part # HR10A-7P-4P) or equivalent connector.

6.3.4. Trigger Input Circuit

Following figure shows trigger signal input circuit of 4 pin connector. Trigger signal entered is delivered to internal circuit through photo coupler. Minimum trigger width that can be recognized at camera is 1us. If trigger signal entered is less than 1us, trigger signal is ignored in camera. External trigger signal can approve signals to the circuits in the 2 methods shown below.

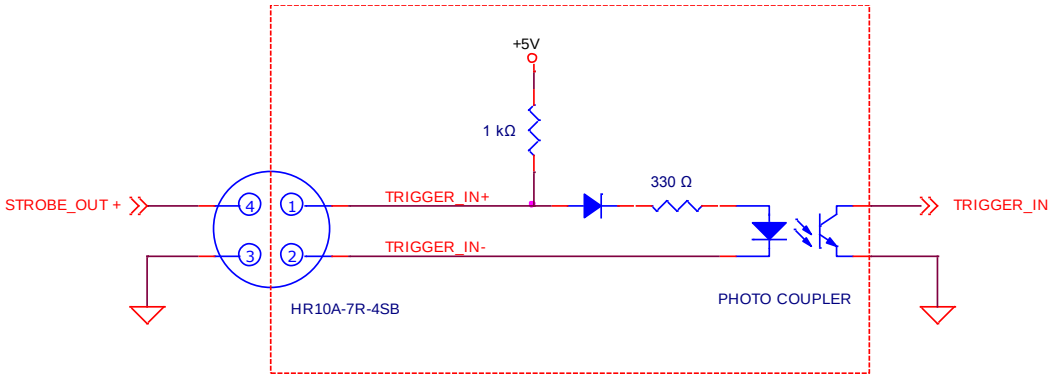


Figure 6.8 Trigger Input Schematic

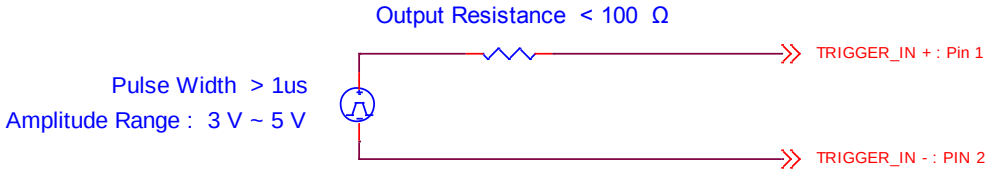


Figure 6.9 Recommended Pulse Trigger Driver Input

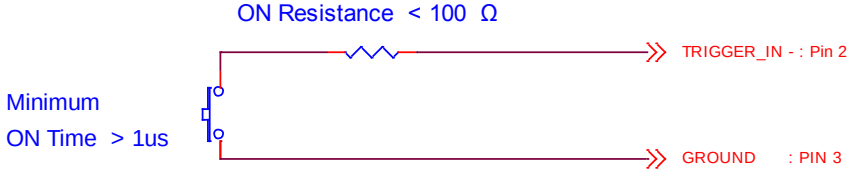


Figure 6.10 Recommended Contact Trigger Input

6.3.5. Strobe Output Circuit

Strobe output signal is output through TTL Driver IC of 3.3 V output level and pulse width of signal is output in synchronization with exposure of camera.

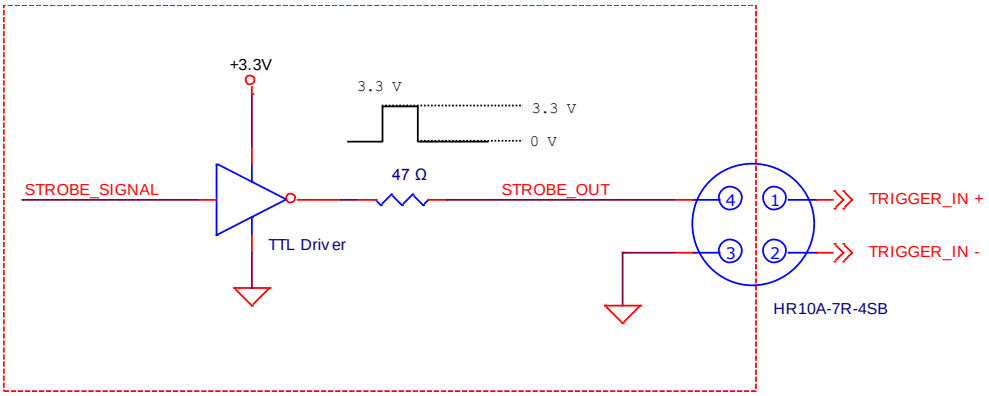


Figure 6.11 Strobe Out Schematic

6.4. Mechanical Dimension

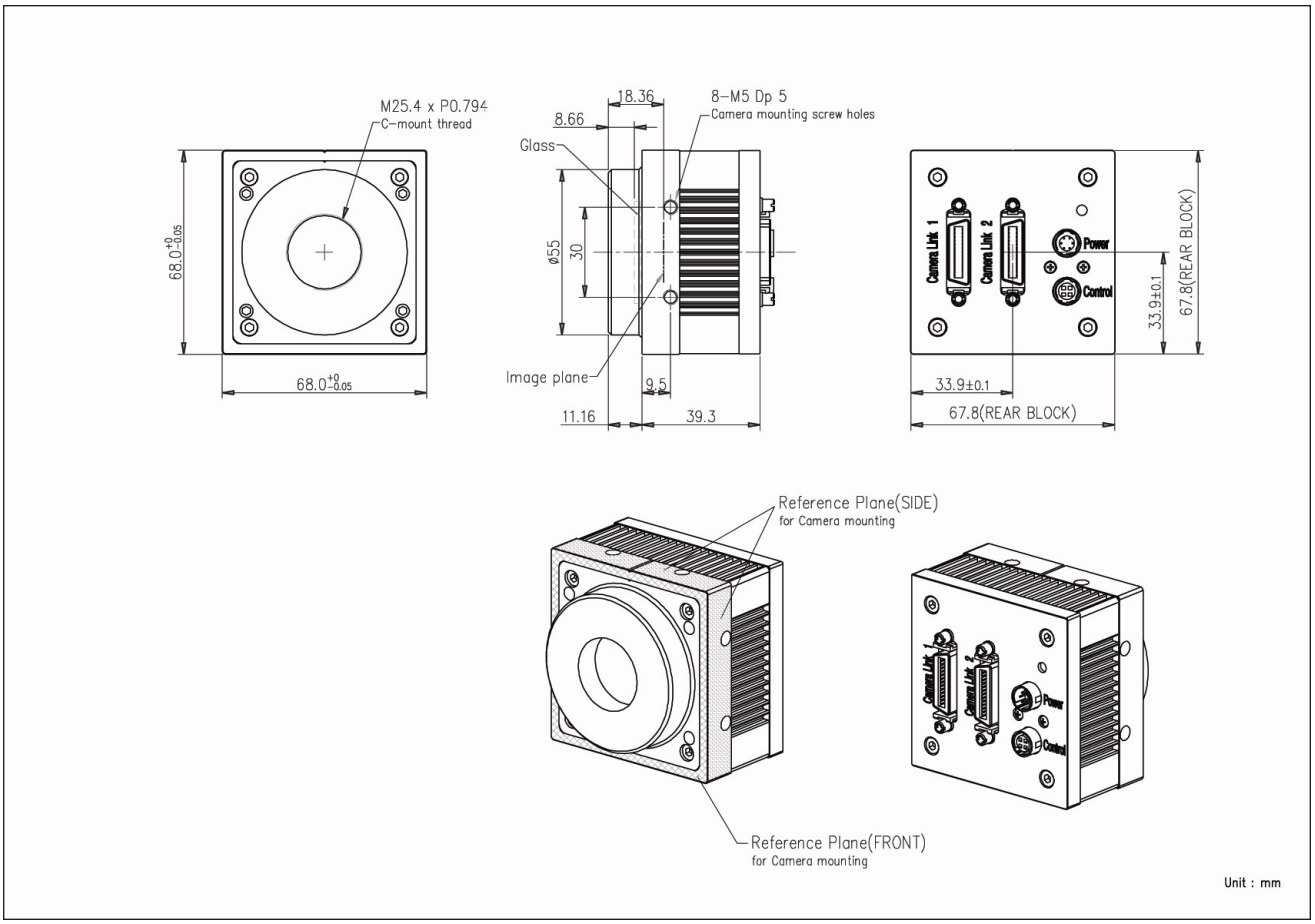


Figure 6.12 Mechanical Dimension

7. Camera Features

7.1. Area Of Interest (AOI)

AOI is the area containing the data required by the user among total areas of image. The user can obtain the image faster, with the quality same as when obtaining overall areas by designating the area as AOI when part of area is required in all areas. AOI is determined as the overlapping area of 2 areas when designating Start point and End point in horizontal and vertical direction as shown in Figure 7.1. Start point and End point mean the starting and end of the area. The narrower Vertical AOI gets, the faster the frame speed. But Horizontal AOI does not affect frame speed.

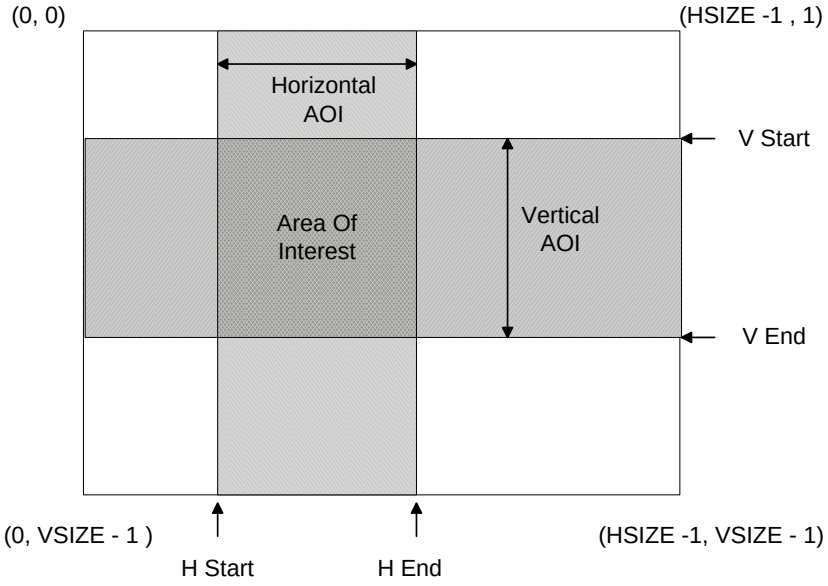


Figure 7.1 AOI

Maximum frame speed depends on change of AOI size as shown in the following table.

AOI Size (H X V)	2 Tap	4 Tap	8 Tap	10 Tap
2048 X 16	3412.9 fps	5464.4 fps	7874.0 fps	8403.3 fps
2048 X 32	2040.8 fps	3558.7 fps	5681.8 fps	6162.8 fps
2048 X 64	1132.5 fps	2092.5 fps	3636.3 fps	4032.2 fps
2048 X 128	599.1 fps	1148.1 fps	2123.1 fps	2375.3 fps
2048 X 256	308.4 fps	603.5 fps	1157.4 fps	1308.9 fps
2048 X 512	156.5 fps	309.6 fps	605.6 fps	688.7 fps
2048 X 1024	78.8 fps	156.8 fps	264.8 fps	353.6 fps

Table 7.1 Maximum Frame Rate per AOI setting

7.2. Exposure

The CMOS sensor of VC series uses global shutter that exposes the entire imager simultaneously. The below figure illustrates the timing of exposure and readout of CMOS sensor. Readout is performed from the first line in consecutive order where readout defines the process of reading the accumulated charges on pixels. Readout Time (also called Transfer Time) defines the rate at which one frame of an image is transferred.

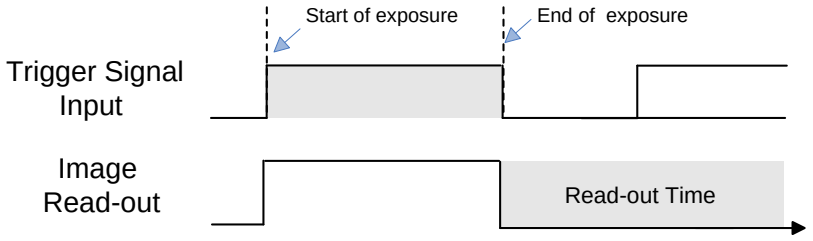


Figure 7.1 Exposure Timing Diagram

7.3. Trigger Mode

Trigger mode of camera is divided into Free-Run mode where image is synchronized to Internal Trigger signal created inside camera, and External Sync mode where image is synchronized to the trigger signal entered in external port.

7.3.1. Free-Run Mode

In Free-Run mode, the cycle of internal trigger signal is determined by Transfer Time (1 Frame data transmission time) and Exposure setting value, and image is obtained with such periodic signal. Cycle of internal signal, that is, Frame Rate, is determined with the following 2 conditions.

- **Case 1 : Exposure Time < Frame Transfer time**
  - ➔ Frame Rate(FPS) = 1/ Frame Transfer Time (sec) : has fixed value
- **Case 2 : Exposure Time > Frame Transfer time**
  - ➔ Frame Rate(FPS) = 1 / Exposure Time (sec) : change depending on Exposure Time value.

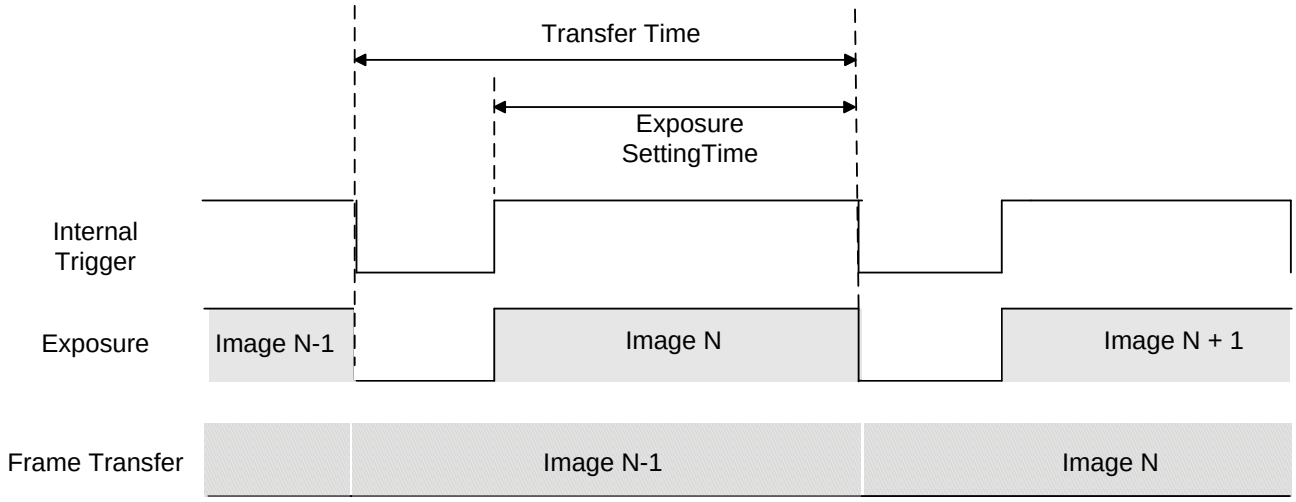


Figure 7.2 Exposure Time is Shorter than Readout Time

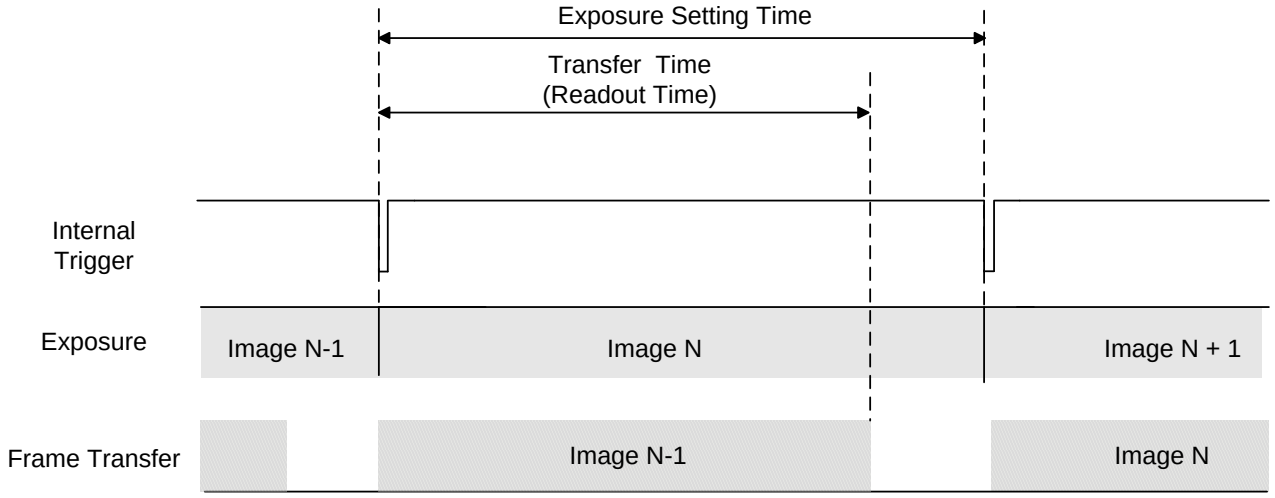


Figure 7.3 Exposure Time is longer than Readout Time

7.3.2. External Sync Mode

In External Sync Mode, camera keeps standby status until trigger signal is entered and performs image transmission (Frame Transfer) after exposure process if trigger input occurs as shown in Figure 7.4. To operate camera in External Sync mode, it is required to set Trigger Source regarding which input, CC1 input port or External Trigger port, will be used for trigger signal, as well as Polarity and Exposure source of signal entered.

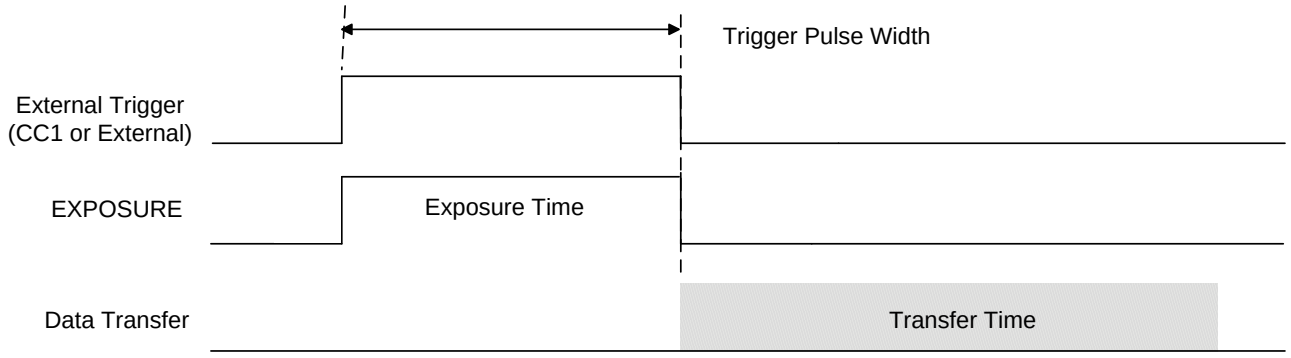


Figure 7.4 External Sync Mode

Following is the summary of basic setting items.

- **Trigger Source:** **select either of CC1(Camera Control Port 1) and External Connector as source of external trigger input signals.**
- **Trigger Polarity:** **set whether polarity of Trigger signal entered is Active High or Active Low.**
- **Exposure Source:** **select to synchronize exposure time with pulse width of trigger input signal or with exposure time programmed inside the camera.**

7.3.2.1. Overlap Trigger input

When trigger input occurs in the course of Frame Transfer and Figure 7.5, it simultaneously performs exposure of next image for new trigger input. In this case, image shooting is possible up to the speed of 1/Transfer Time(sec), the Maximum Frame Rate conditions regardless of exposure time.

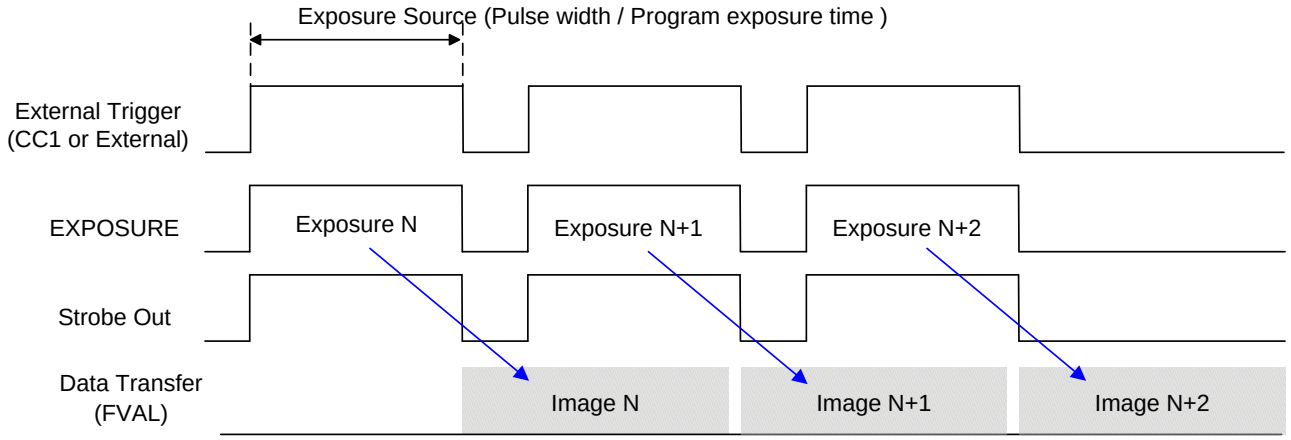


Figure 7.5 Camera Operation at Input of Overlap Trigger

Following list shows the operation of camera on exceptional trigger input.

- **When the trigger signal with cycle faster than maximum Frame Rate conditions, next Frame Transfer is performed while one Frame Transfer is not completed, failing to obtain overall image.**
- **When new trigger input occurs in Exposure section while Exposure Source is set in Program, the signal is ignored. It is the case that exposure setting value is set longer than trigger input cycle, and since it is not synchronized for all trigger signal entered in camera, Frame Rate gets slower than Trigger input cycle.**

7.4. Camera Link Output

VC 2MC and 4MC model supports 2 Tap, 4 Tap, 8 Tap or 10 Tap output modes according to user interface. Tap setting value means the number of pixel data output for each cycle of Pixel Clock (85 MHz), and speed of Frame Data transmission varies depending on tap setting. Frame Data is output in interleaved type and as shown in Figure 7.6. This Tap setting can be set using “scl” command.

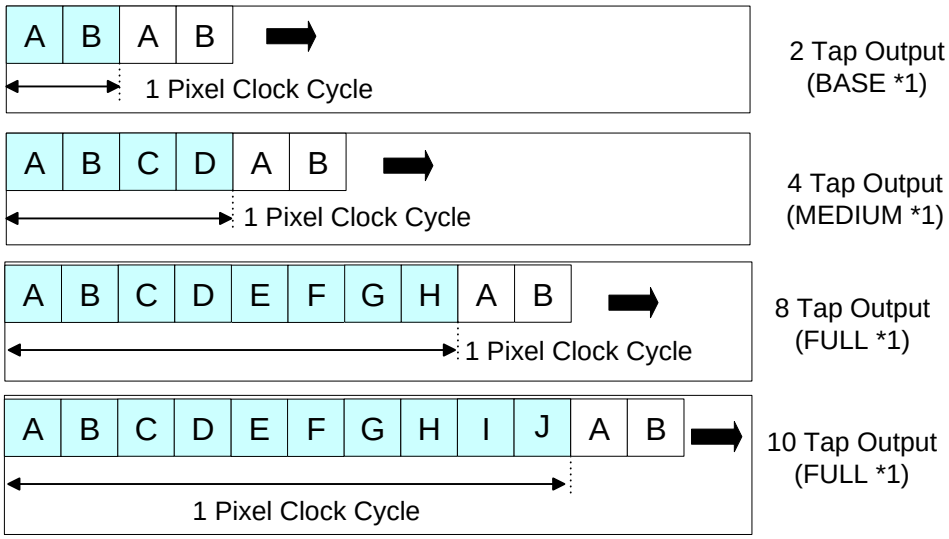


Figure 7.6 Camera Link Output configuration

7.5. Gain and Offset

Gain and Offset can be changed through Voltage Reference adjustment applied commonly to all ADCs. Gain adjustment scope can be set between 0 ~ 12 dB and setting value has values in 64 steps. Relation between setting value and actual Gain(dB) are as shown below:

Gain(dB) = (setting value) x 0.19dB

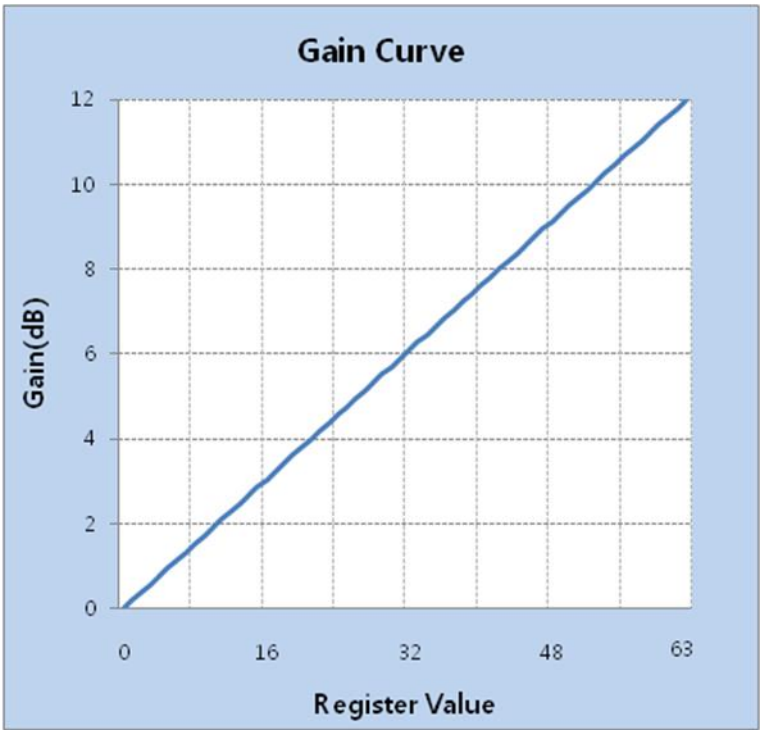


Figure 7.7 Register Setting vs Gain

Offset can be set between 0 ~ 64 (LSB) based on 8 bit Data output and setting value has a total of 64 steps value.

7.6. Temperature Monitor

Camera has sensor chip for monitoring internal temperature. “gct” command is used to check the temperature of camera.

7.7. Status LED

Green LED on back of camera shows the operation status of camera. LED status and camera status corresponding to this are as follows:

- **Continuous ON Status** – camera operates in Free-Run Mode
- **ON for 0.5 sec. and OFF for 0.5 sec. repeats** – camera operates in Trigger Mode.
- **ON for 1 sec. and OFF for 1 sec. repeats** – Test Image is output.
- **ON for 0.25 sec. and OFF for 0.25 sec. repeats** – operates in Trigger Mode and Test Image is output

7.8. Test Image

It can be set to output test image created inside instead of image data output from image sensor, in order to check normal operation of camera. 3 types of test image are available; image with different values in horizontal direction (Figure 7.8), images with different values in diagonal direction (Figure 7.9), and moving image with different values in diagonal direction (Figure 7.10). Test image can be applied to all operation modes of camera and set using “sti” command.

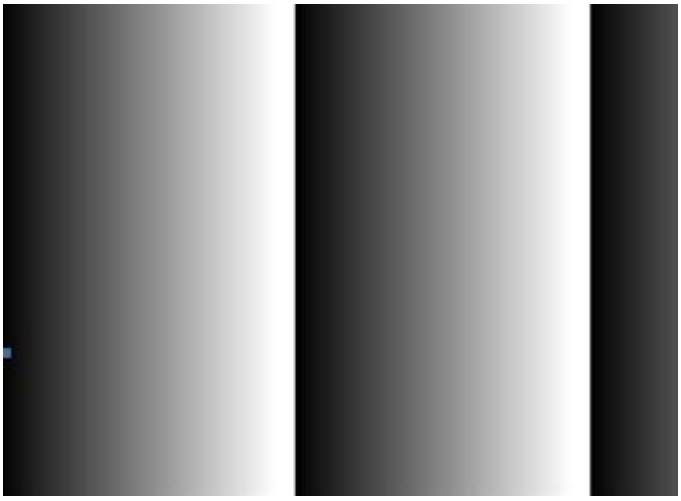


Figure 7.8 Test Image 1

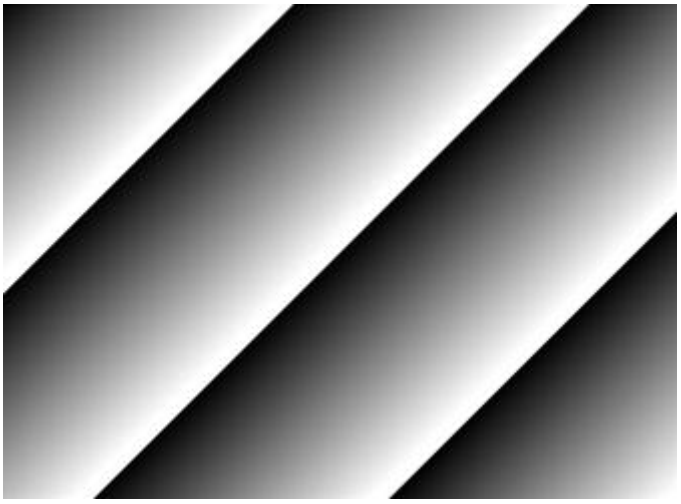


Figure 7.9 Test Image 2

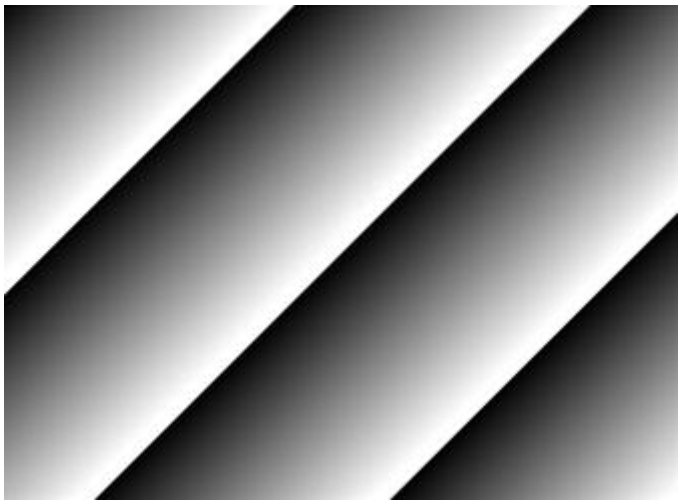


Figure 7.10 Test Image 3 (Moving Pattern)

7.9. Strobe

Strobe signal is used to synchronize the external light source with camera or to measure the exposure time applied to the current camera.

7.9.1. Strobe Output

Strobe outputs the signal synchronized with exposure time of the camera to the external port. Strobe output signal is shown below.

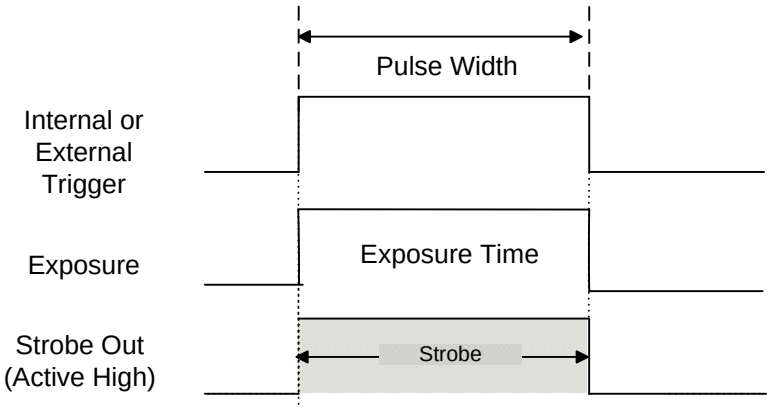


Figure 7.11 Strobe signal in Trigger mode

7.9.2. Strobe Polarity

Polarity can be set for Strobe signal output. “ssp” command is used to set the polarity of strobe signal.

7.10. Field Upgrade

This camera has the function to upgrade firmware and FGPA logic through RS-644 interface of Camera Link, rather than disassembly of camera in the field. See Appendix A for how to change in details.

7.11. Dark Image Correction

Fixed Pattern Noise of CMOS sensor varies depending on operating temperature of camera due to change in features according to temperature of ADC and sensor cell It may result in lower sensitivity at Dark Level. Sensitivity change due to temperature change is less than 1 dB/10 degree. The variation due to temperature change is not big and acquisition condition of corrected data is 25 degree based on case temperature. For optimization of user to environmental conditions, it is recommended to correct after the temperature of camera case gets stabilized while camera is installed.

- **Correction Sequence of Camera Dark Image**

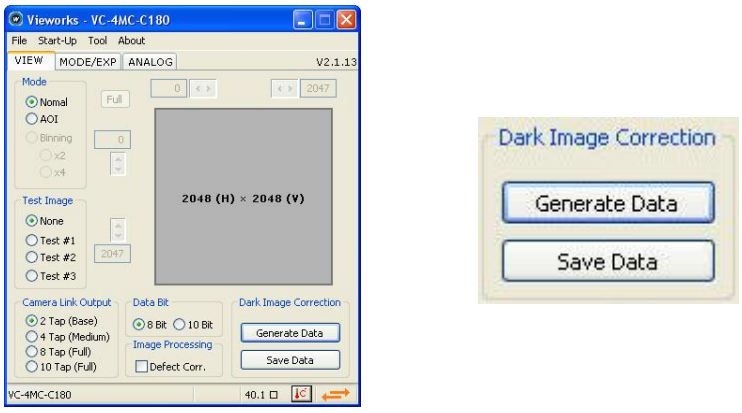


Figure 7.12 Dark Image Correction

- How to Correct Image using Configurator

1. Prevent penetration of light into camera image sensor.
2. Click “Generate Data” button in “Dark Image Correction” of “View” tab to generate correction data.
3. Click “Save Data” button to save correction data in the flash memory.

- How to Correct Image using Serial Command

1. Prevent penetration of light to camera image sensor.
2. Use terminal command “gop” to generate correction data in camera.
3. Use terminal command “sop” to save correction data in flash memory.

8. Serial Communication

8.1. Setup command

All setup in camera is carried out RS-644 serial interface of camera link. With the following communication setting, it can be controlled using terminal or direct control at user application.

- BOUD Rate : 19200 bps
- Data Bit : 8 bit
- Parity Bit : No Parity
- Stop bit : 1 stop bit
- Flow control : None

All types of camera setting commands except Firmware Download, requiring massive data transmission are delivered in ASCII command type. All camera setup commands start from user application and the camera returns the response(“OK”, “Error” or information) for command The camera informs the completion of command execution through response with write command, while the camera returns the error response or information with read command.

Command format

<command> <parameter1> <parameter2> <cr>

0~2 parameters follow the command.

Response:

- If execution of write command is successfully completed

OK <cr> <lf> <prompt>

- If execution of read command is successfully completed

<parameter1> <cr> <lf> <prompt>

- If execution of command is not completed

Error : <Error Code> <cr> <lf> <prompt>

ex) Write command

In response to a “set 100” command the camera will return (in hex value)

Command : set 100<cr>

(73 65 74 20 31 30 30 0D)

Response : Set 100<cr><lf> OK<cr><lf> >

(73 65 74 20 31 30 30 0D 0A 4F 4B 0D 0A 3E)

ex) Read command

In response to a “get” command the camera will return (in hex value)

Command : get <cr>

67 65 74 0D

Response : 67 65 74 0D 0A 31 30 30 0D 0A 3E

get<cr><lf> 100<cr><lf> >

echo response prompt

8.1.1. Types of Error Code

0x80000481 : values of parameter not valid

0x80000482 : number of parameter is not matched

0x80000484 : command that does not exist

0x80000486 : no execution right

8.2. Parameter Storage Space

The camera has 3 non-volatile storage space used for parameter storage and 1 volatile work space that is applied to actual camera operation. 3 storage space is divided into Factory Space that contain basic value at the factory, and 2 user space(User Space 1, User Space 2) that can save parameter value temporarily set by the user. User space can be read and written, but Factory space can be read only.

At camera booting, setting value in one of 3 storage spaces is copied to work space according to Config Initialization value and value of the space is used for camera setting. Since values in work space is valid only while the power is on, it should be copied to user space 1 or user space 2 using “sct” command.

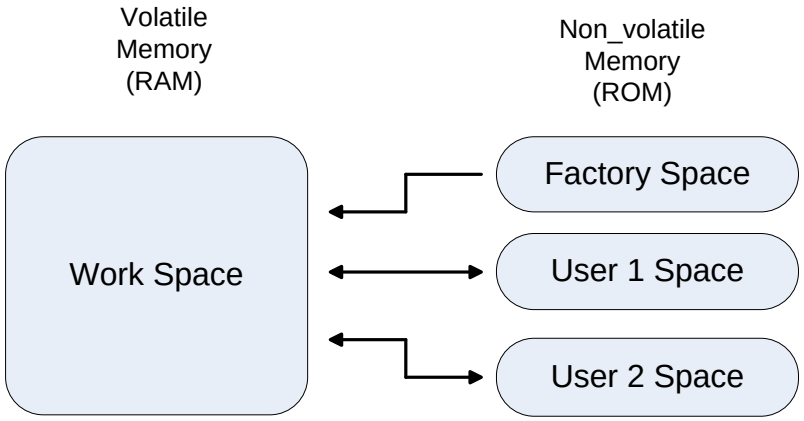


Figure 8.1 Parameter

8.2.1. Camera Setting Command List #1

Command	Syntax	Value Returned	Description
Help	h	String	Displays a list of all commands
Set Read-Out Mode **Get Read-Out Mode**	srm 0|1 grm	OK 0|1	0 : Nomal Mode 1 : AOI(Area Of Interest) Mode (AOI area is set using “sha” and “sva” commands)
Set Horizontal Area **Get Horizontal Area**	sha n1 n2 gha	OK n1 n2	n1: Starting point of horizontal direction n2 : End point of horizontal direction
Set Vertical Area **Get Vertical Area**	sva n1 n2 gva	OK n1 n2	n1 : Starting point of vertical direction n2 : End point of vertical direction
Set Trigger Mode **Get Trigger Mode**	stm 0|1 gtm	OK 0|1	0 : Free Run Mode 1 : Trigger/Overlap Mode
Set Trigger Source **Get Trigger Source**	sts 1|2 gts	OK 1|2	1 : CC1 Port Input 2 : External Input
Set Trigger Polarity **Get Trigger Polarity**	stp 0|1 gtp	OK 0|1	0 : Active Low 1 : Active High
Set Exposure Time **Get Exposure Time**	set n get	OK N	n : Exposure Time in us (Setting range : 10 ~ 7,000,000 us)
Set Analog Gain **get Analog Gain**	sag n gag	OK n	n :Analog Gain Parameter (Setting Range : 0 ~ 63)
Set Analog Offset **get Analog Offset**	sao n gao	OK n	n :Analog Gain Parameter (Setting Range : 0 ~ 63)
Set Test Image **Get Test Image**	sti 0|1|2|3 gti	OK 0|1|2|3	0 : OFF 1,2 : Fixed Pattern Image 3 : Moving Pattern Image
Set Strobe Polarity **Get Strobe Polarity**	ssp 0|1 gsp	OK 0|1	0 : Active Low 1 : Active High
Generate Offset –Calibration Data	god	OK	Generate offset Calibration Data to the volatile Memory
Save Offset-Calibration Data	sod	OK	Save offset Calibration Data to the Flash Memory
Load Offset-Calibration Data	Lod	OK	Load offset Calibration Data from the Flash Memory (the calibration data is loaded Automatically at the Stat-up status)

8.2.2. Camera Setting Command List #2

Command	Syntax	Value Returned	Description
Set Defect Correction **Get Defect Correction**	sdc 0|1 gdc	OK 0|1	0 : Off 1 : Active of Defect Correction
Set Camera-Link Mode **Set Camera-Link Mode**	scl 0|1|2|3 gcl	OK 0|1|2|3	0 : 2 Tap's Output 1 : 4 Tap's Output 2 : 8 Tap's Output 3 : 10 Tap's Output

8.2.3. Camera Configuration Command List

Command	Syntax	Value Returned	Description
Save Config To	sct 1|2	OK	1 : Save to User 1 Setting 2 : Save to User 2 Setting
Load Config From	lcf 0|1|2	OK	0 : Load from Factory Setting 1 : Load from User 1 Setting 2 : Load from User 2 Setting
Set Config Initialization **Get Config Initialization**	sci 0|1|2 gci	OK 0|1|2	0 : Load from Factory Setting when initializing 1 : Load from User 1 Setting when initializing 2 : Load from User 2 Setting when initializing
Get Model Name	gmn	String	Displays Model Name
Get MCU Version	gmv	String	Displays MCU Version
Get FPGA Version	gfv	String	Displays FPGA Version
Get Serial Number	gsn piece	String	Display Serial Number
Get Current Temperature	gct	String	Display Temperature Value

8.3. Configurator GUI

8.3.1. Camera Scan

When you execute the program while the camera is turned on, Camera Scan window appears as shown in Figure 8.2. At this time, the program checks serial port of computer and DLL provided by Camera Link to scan whether the camera is connected. If there is a camera connected, it displays model name on the screen. If the camera is not properly displayed on the screen, check the connection of cable with power of camera and press refresh button. When you double-click model name displayed on the screen, Configurator is executed and displays current setting value of camera connected.

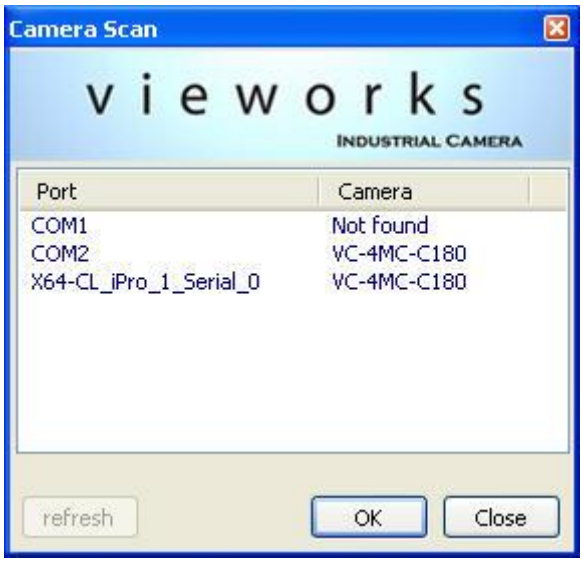


Figure 8.2 Camera Configurator Loading Window

8.3.2. Menu

8.3.2.1. File

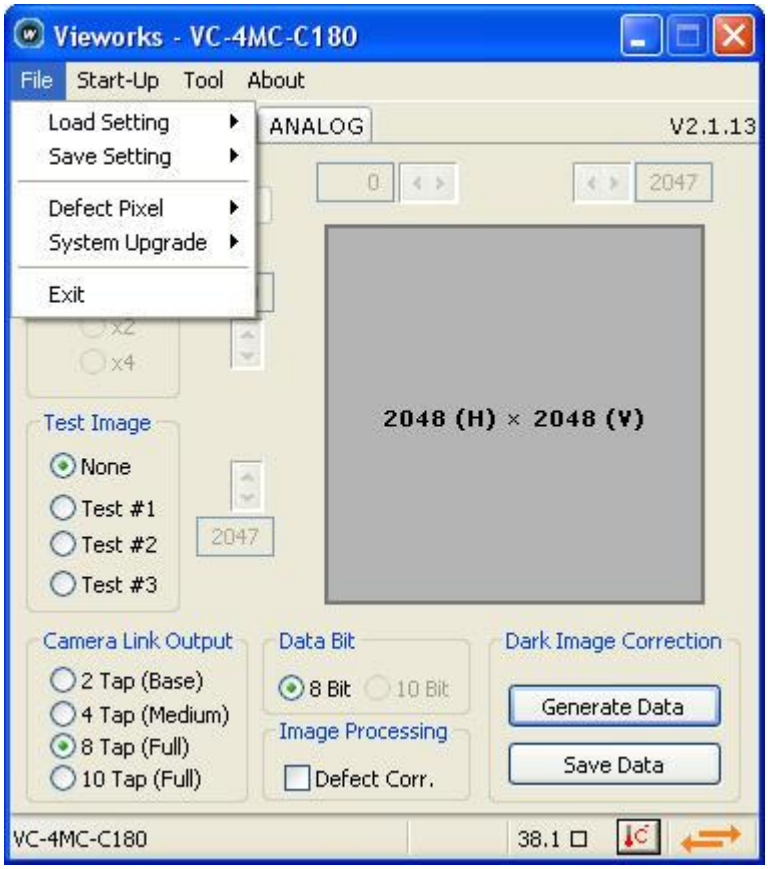


Figure 8.3 File Menu

- **Load Setting:** load setting value of camera, from setting value storage space (Factory, User1, User2) inside the camera or file in the computer.
- **Save Setting:** save setting value of camera in setting value storage space (User1, User2) inside the camera or file in the user computer.
- **Defect Pixel:** download Defect information to camera (Download to Camera) or upload the Defect information saved in camera to user computer (Upload to PC)
- **System Upgrade:** upgrade MCU program or FPGA logic.
- **Exit:** exit program.

8.3.2.2. Start-Up

The menu to select the space to load the setting value from, when the camera is turned on.

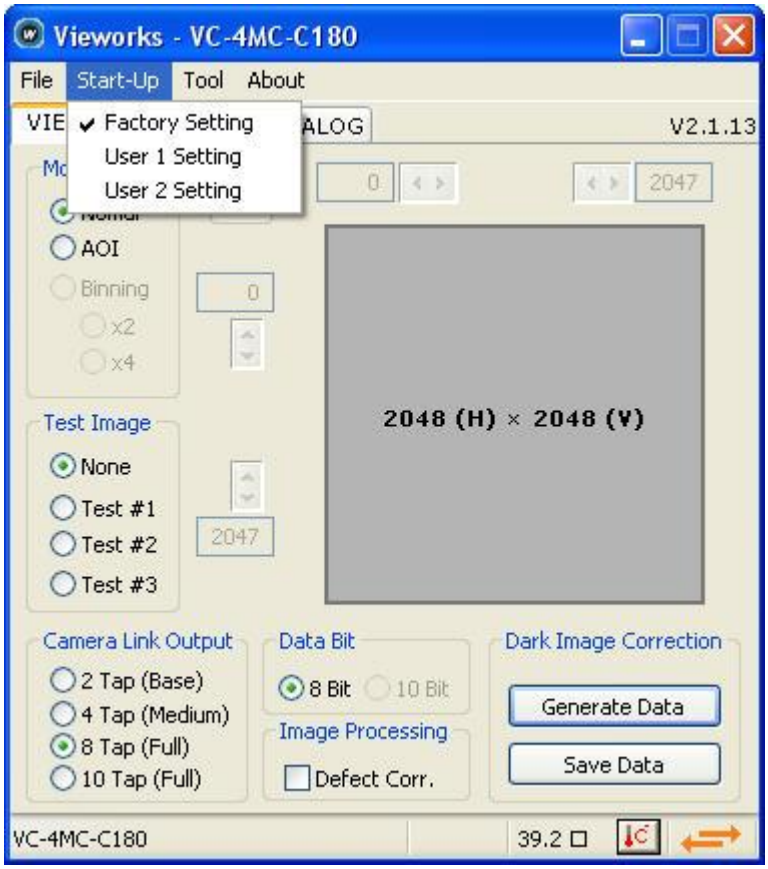


Figure 8.4 Start-Up Menu

- **Factory Setting:** load the setting value from Factory space when camera is turned on.
- **User1 Setting:** load the setting value from User1 space when camera is turned on.
- **User2 Setting:** load the setting value from User2 space when camera is turned on.

8.3.2.3. Tool

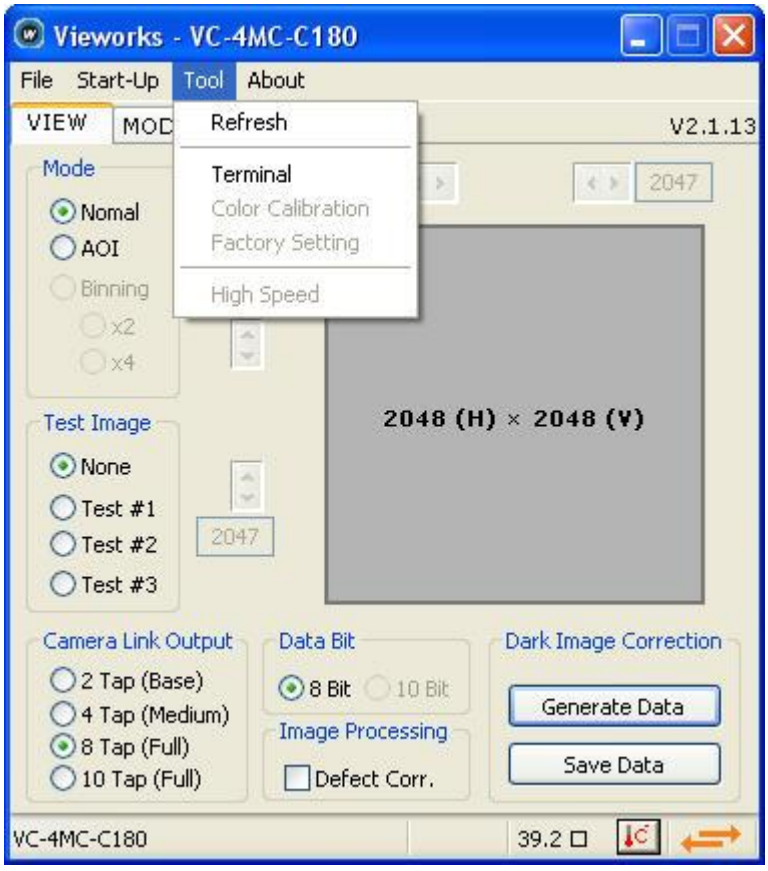


Figure 8.5 Tool Menu

- **Refresh:** Read the current setting value of camera and display on program.
- **Terminal:** Display user command in GUI in terminal. Click to display the terminal window on the lower part of program and click again to hide Terminal window.
- **High Speed:** Not supported in VC Model.

8.3.2.4. About

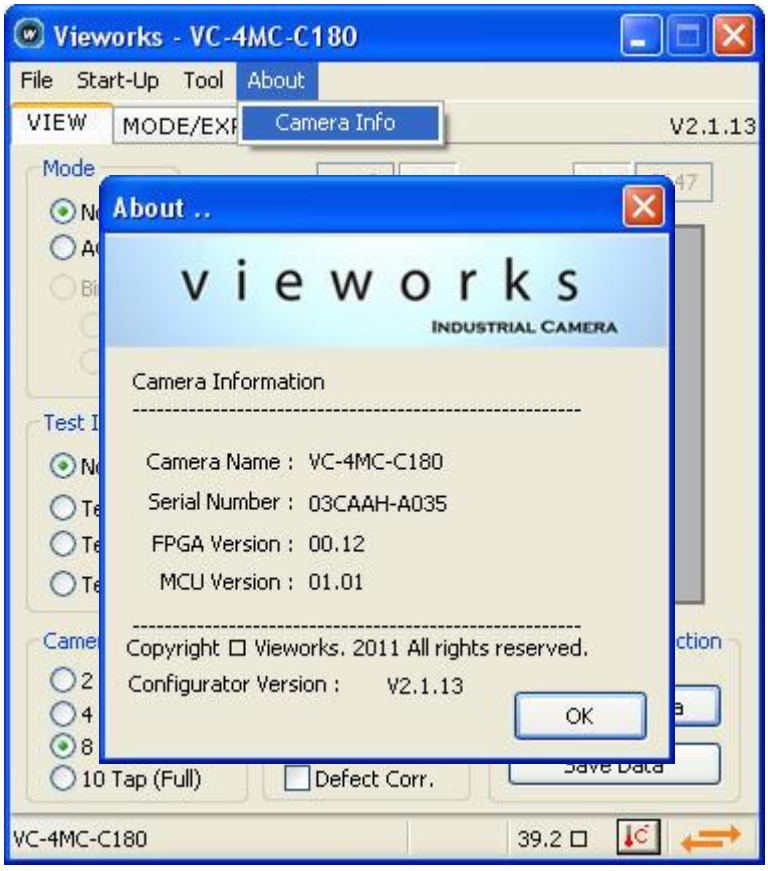


Figure 8.6 About Menu

- **Camera Info:** display camera information (product name, serial number, version, etc.).

8.3.3. Tab

8.3.3.1. VIEW tab

VIEW tab allows the user to set the camera readout mode, test image mode, data bit, channel, LUT, image processing, etc.

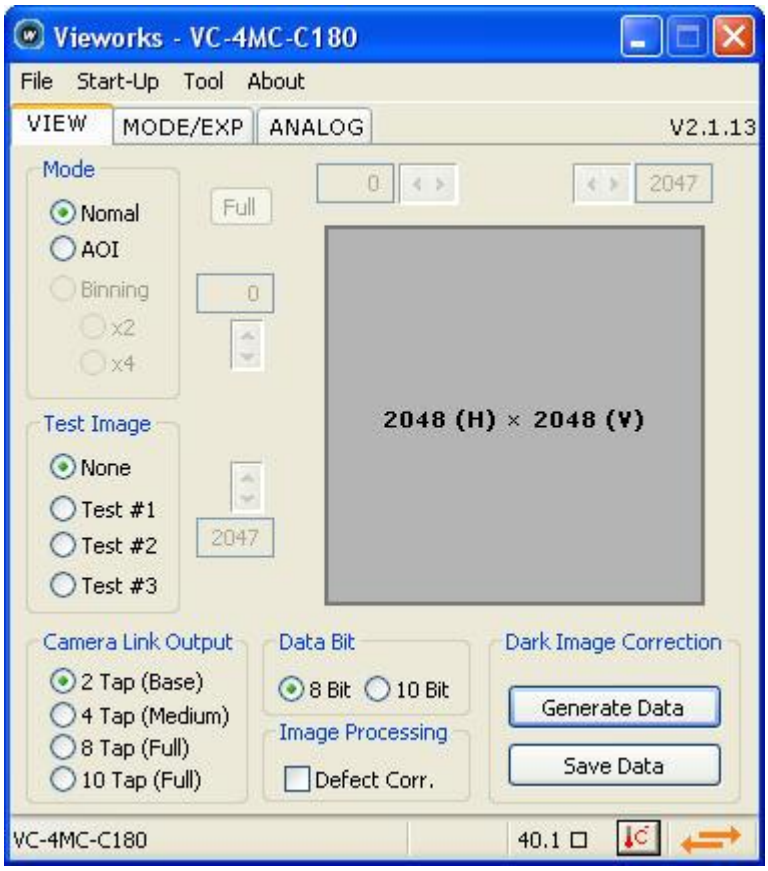


Figure 8.7 VIEW Tab.

- **Mode:** The Normal outputs the Full Resolution of the camera and the AOI mode outputs only a pre-set area.
- **Test Image:** Selects whether to apply test image and the type of test image.
- **Camera Link Output:** Selects Camera Link output mode.
- **Data Bit:** Selects width of data output.
- **Dark Image Correction:** Corrects Fixed Pattern Noise at camera dark image.
- **Image Processing:** Sets Defect Correction function On or Off.

8.3.3.2. MODE/EXP Tap

This tab is to set Trigger mode, exposure time and Strobe setting.

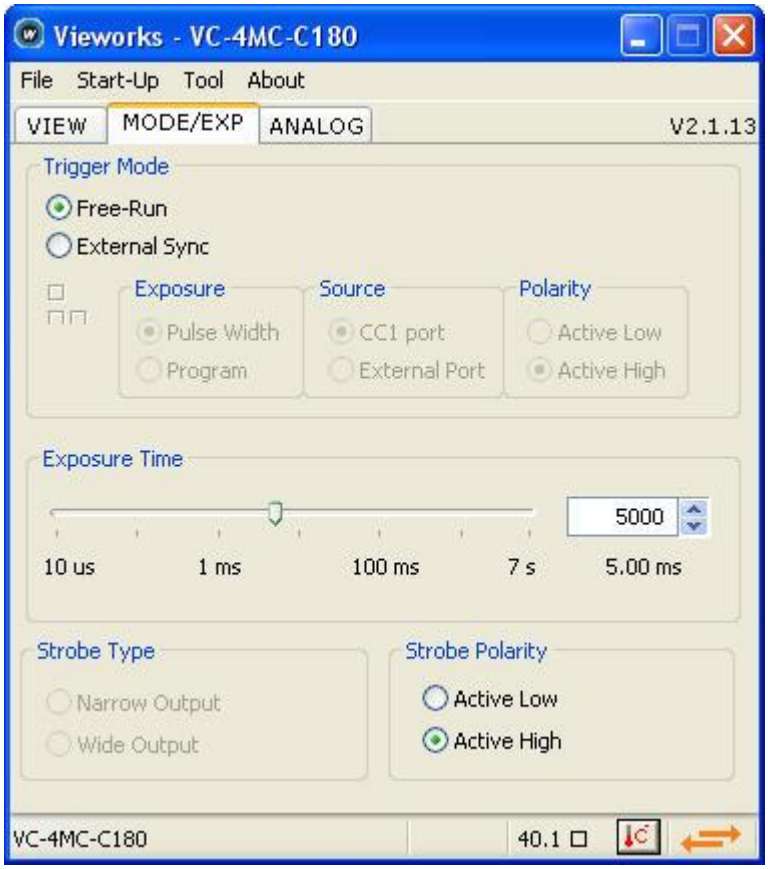


Figure 8.8 MODE/EXP Tab

- **Trigger Mode:** Selects trigger mode.
- **Exposure:** Selects exposure source.
- **Source:** Selects trigger source.
- **Polarity:** Selects polarity of trigger input.
- **Exposure Time:** Sets exposure time when trigger mode is set with Free-Run mode or when Exposure is set with program.
- **Strobe Type:** Sets strobe type.
- **Strobe Polarity:** Sets the polarity of strobe output signal.

8.3.3.3. ANALOG Tab

This tab is to set gain and Offset setting of image.

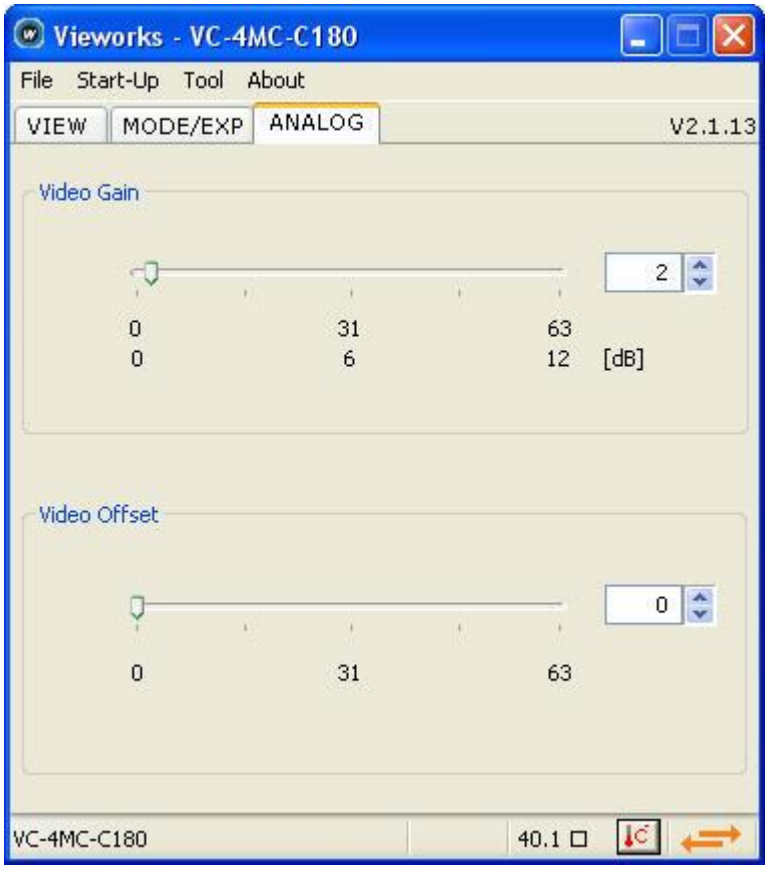
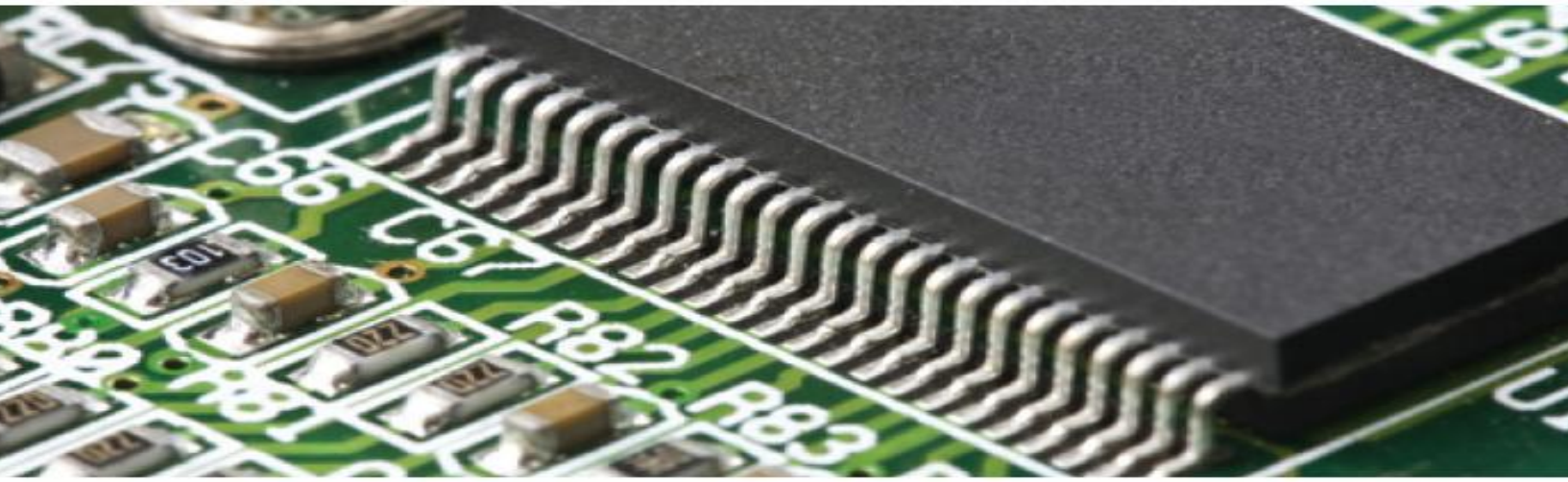


Figure 8.9 ANALOG Tab

- **Video Gain** : Sets gain value.
- **Video Offset** : Sets offset value.



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